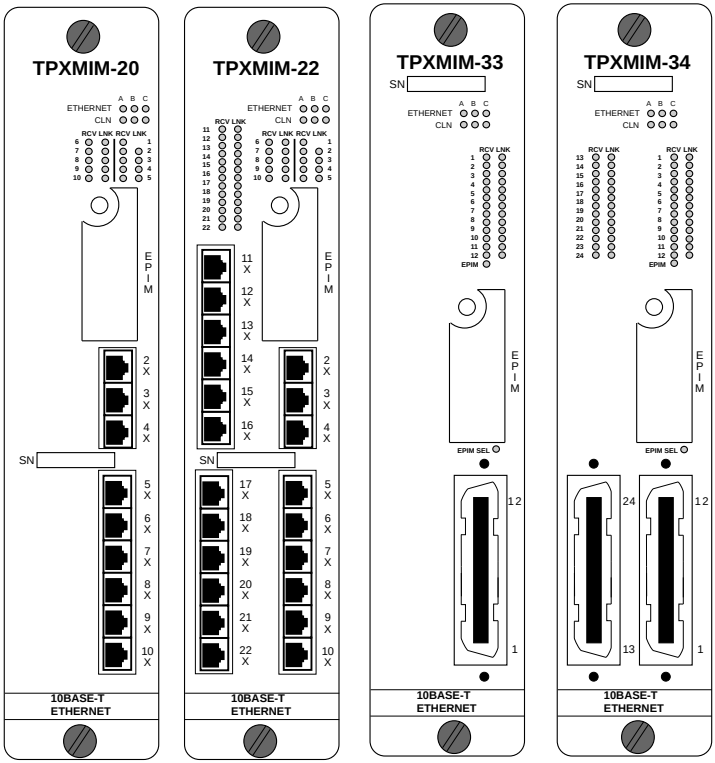
TPXMIM

INSTALLATION GUIDE



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The Complete Networking Solution™

CABLETRON SYSTEMS, P.O. Box 5005, Rochester, NH 03867-0505

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CHAPTER 1

INTRODUCTION

The **Twisted Pair Switching Media Interface Module (TPXMIM)** is a switchable multi-channel Ethernet repeater that resides in a Multi Media Access Center® (MMAC) hub. This manual explains how to:

- install the TPXMIM
- connect the module to an existing network
- troubleshoot any installation/operational problems.

In addition, Appendices contain TPXMIM and Ethernet Port Interface Module (EPIM) environmental and operational specifications.

This manual serves as a simple installation and troubleshooting reference guide for the TPXMIM. To gain a full understanding of this device and its capabilities, and to help eliminate any potential problems during or after installation, please be sure to read and understand all of the instructions and information in this document and in the release notes.

1.1 USING THIS MANUAL

You should have a general working knowledge of Ethernet or IEEE 802.3 type data networks prior to installing the TPXMIM. The following summarizes the organization of this manual.

Chapter 1, **Introduction**, discusses TPXMIM features, and provides an overview of the device's capabilities. This chapter concludes with a list of related documentation and how to obtain additional support related to TPXMIM installation and operation.

Chapter 2, **Specifications/Requirements**, provides specifications and network requirements to consider before installing the TPXMIM.

Chapter 3, **Installation/Configuration**, provides instructions/guidelines on how to install the TPXMIM into an MMAC-FNB, set the board or individual ports to a specific MMAC Channel, install/replace an optional EPIM, and connect segments to your device using an optional EPIM.

Chapter 4, **Testing/Troubleshooting**, provides some testing procedures to ensure the TPXMIM is working properly before installing it into your network. This chapter also details the TPXMIM LANVIEW® LEDs that enable you to quickly diagnose network/operational problems and includes a troubleshooting checklist.

Appendix A, **Twisted Pair Wiring Tables**, provides the wiring tables to assist in using a punchdown block to wire twisted pair segments.

Appendix B, **EPIM Specifications**, lists the specifications for each optional EPIM available for the TPXMIM.

1.2 TPXMIM FEATURES

LANVIEW

Cabletron provides a visual diagnostic and status monitoring system, called LANVIEW, with the TPXMIM. LANVIEW LEDs help you quickly identify device, port, and physical layer problems.

"Switching"

The TPXMIM brings "bank switching" and individual "port assignment" to the MMAC chassis. Using any multi-channel management module (i.e., the EMME or EMM-E6), you can assign either the entire board (bank switching) or each individual port (port assignment) to any of the three Ethernet channels on the MMAC-FNB (i.e., Channel A, B, or C).

Connectivity

The TPXMIM series offers four connector versions:

- TPXMIM-20 — nine RJ45 ports; one EPIM port
- TPXMIM-22 — twenty-one RJ45 ports; one EPIM port
- TPXMIM-33 — one 50-pin Champ connector; one EPIM port
- TPXMIM-34 — two 50-pin Champ connectors; one EPIM port

MIB Navigation

Assigning the TPXMIM board or individual ports to specific Ethernet channels, or obtaining TPXMIM board or port statistics, requires a multi-channel management device (e.g., EMME or EMM-E6) and access to a MIB walking tool. The EMME or EMM-E6 allows MIB access both locally (i.e., Local Management) and remotely (i.e., additional Cabletron Remote Management packages).

For information on how to use the Local Management MIB walking tool, refer to either the EMME or EMM-E6 Local Management manual. For information on how to use a Remote Management MIB walking tool, refer to documentation specific to that Remote Management package.

Compliance

Each TPXMIM utilizes Repeater Interface Controller (RIC) technology. RIC technology integrates all repeater functionality into one integrated circuit. This makes the TPXMIM fully 10Base-T IEEE 802.3i compliant.

Fault Tolerance

By performing its own repeater functions, the TPXMIM greatly enhances the fault tolerance of the MMAC. By not relying on one central module to perform repeater functions, TPXMIMs eliminate a single point of failure.

In addition, the TPXMIM provides port segment partitioning and reconnection. This feature assures that problem segments do not affect any other segments. If the TPXMIM detects 31 consecutive collisions on any segment, or if a collision detector remains on for more than 110 µs, the TPXMIM automatically partitions that segment. When the TPXMIM receives a good packet from the segment, it automatically reconnects.

1.3 OVERVIEW

The **Twisted Pair Switching Media Interface Module (TPXMIM)** provides board or individual port connectivity to any MMAC-FNB Ethernet Channel (i.e., Channels A, B, or C). All ports initially default to Channel B upon power up and require a Management Information Base (MIB) change to access any other channel. Refer to Chapter 3, **Installation/Configuration**, for additional information on how to assign the TPXMIM board or individual ports to specific channels.

The TPXMIM repeats (regenerates, retimes, and transmits) each packet it receives, assuring data integrity and maximum data path distance. Using Repeater Interface Controller (RIC) technology, each TPXMIM complies fully with the 10Base-T IEEE 802.3i standard connectivity for Ethernet communications over shielded or unshielded twisted pair cabling.

In addition to providing full connectivity to the MMAC backplane, each TPXMIM provides the option of installing an external Ethernet Port Interface Module (EPIM). Each TPXMIM provides one slot on the front panel for your choice of an optional EPIM. EPIMs provide an additional Ethernet connection for various media types (twisted pair, fiber optic, and thick or thin Ethernet coaxial cable). The following list contains the currently available EPIMs and their media types:

- **EPIM-T**: 10Base-T Twisted Pair Segment Interface Module
- **EPIM-F1/EPIM-F2**: Multimode Fiber Optic Segment Interface Modules using SMA/ST style connectors
- **EPIM-F3**: Single Mode Fiber Optic Segment Interface Module
- **EPIM-C**: Thin-net Coaxial Segment Interface Module
- **EPIM-A/EPIM-X**: AUI Cable Segment Interface Modules

Since the TPXMIM is SNMP compliant, you can control and monitor the device using various SNMP Network Management packages including Cabletron Systems' **SPECTRUM**® Portable Management Applications (SPMA) products.

1.4 THE TPXMIM AND MANAGEMENT MODULES

The TPXMIM requires a multichannel management module (i.e., EMME, EMM-E6, etc.) in slot #1 (farthest right slot) of the MMAC. The multi-channel management module provides the capability of setting the board or individual ports to Channels other than Channel B (default), and repeating to any Channel (i.e., Channel A, B, or C). In addition, the use of a multi-channel management module provides helpful statistical information for the TPXMIM including:

- the number of bytes received
- the number of frames received, filtered, and transmitted
- the total number of errors and a breakdown of those errors.

Multi-channel management modules provide bridging and optional routing control for Ethernet Channels A, B, and C on the MMAC backplane, and Channel D from the module faceplate. All Channels access the same shared memory, allowing a management module to bridge any or all packets it receives for any given Channel. In addition, the EMM-E6 provides options for two additional Ethernet connections (channels E and F) that access WAN, ATM or FDDI networks.

For additional information regarding the EMME or EMM-E6, refer to specific module documentation.

1.5 THE TPXMIM AND MMAC BACKPLANE

The Multi Media Access Center with Flexible Network Bus (MMAC-FNB) provides the TPXMIM with power, Ethernet A Bus (Channel A), and FNB (Channel B and C) access (Figure 1-1).

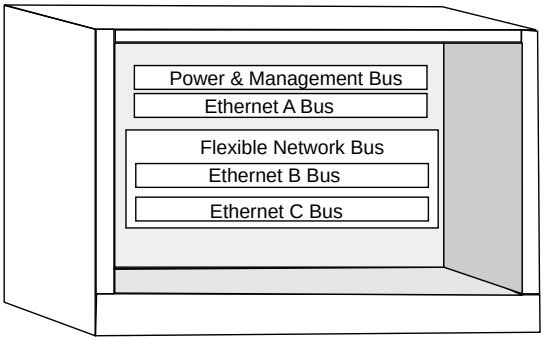

Figure 1-1. MMAC Flexible Network Bus

Two types of MMACs currently support FNB architecture — shunting and non-shunting. MMACs equipped with shunting backplanes allow modules operating on the B or C bus to continue communicating regardless of whether there is an empty slot or an A Channel module between them in the chassis. The following table gives the part numbers of the MMAC chassis that have shunting capabilities.

Table 1-1. MMACs with Shunting Capabilities

MMAC Chassis	Part #
MMAC-3FNB	**FC**000000000 or above
MMAC-5FNB	**CC**000000000 or above
MMAC-8FNB	**CG**000000000 or above
MMAC-M8FNB	**DK**000000000 or above
MMAC-M5FNB	all
MMAC-M3FNB	all

Note: *If your MMAC does not have a shunting backplane, upgrade kits are available. For additional information on shunting backplanes, or how to upgrade your hub, contact Cabletron Systems Technical Support.*

Ethernet Channel A operates over the MMAC Power and Management Bus, Cabletron's original Ethernet channel.

1.6 LANVIEW LEDs

The TPXMIM incorporates the Cabletron Systems LANVIEW® Status Monitoring and Diagnostics System. LANVIEW LEDs can help diagnose any problems, such as a power failure or a cable fault.

Each port on the TPXMIM-20/22 modules include the following LANVIEW LEDs:

- a **RCV** (receive) LED to indicate network activity on the port
- a **LNK** (link) LED to indicate the connection status of the port.

The TPXMIM-33/34 modules utilize the above LANVIEW LEDs for all ports except the EPIM ports. The EPIMs for the TPXMIM-33/34 use the following LANVIEW LEDs:

- a **RCV** (receive) LED to indicate network activity on the port

- a **SEL** (select) LED to indicate port association selection of the EPIM port. The **SEL** LED on the TPXMIM-33 is always lit since the EPIM is always active. **However**, the TPXMIM-34 provides the software selectable option of using the EPIM instead of 10Base-T Champ connector port 13. In other words, on the **TPXMIM-34**, you can have **either** the EPIM **or** Champ connector port 13 active at any given time. This allows a total of 24 connections.

The TPXMIM includes the following LEDs to indicate Channel status:

- a **CLN** (collision) LED for each channel (i.e., A, B, and C)
- an **Ethernet** LED to indicate any connection to a particular Ethernet channel (i.e., A, B, or C).

Note: *If at least one port connects to a particular Channel, the Ethernet LED for that Channel remains ON.*

Chapter 4, **Testing/Troubleshooting**, provides detailed descriptions of each TPXMIM LANVIEW LED.

1.7 NETWORK MANAGEMENT CAPABILITIES

You can control and manage the TPXMIM using any SNMP network management system. The EMME or EMM-E6 network management capabilities provide the necessary management tools for the TPXMIM to operate at its full capacity.

Your ability to set up parameters with network management assures optimal performance of the TPXMIM. For further information, refer to the applicable Network Management Package User's Manual.

1.8 RELATED MATERIAL

Use the following manuals to supplement the procedures and other technical data provided in this manual. This manual references procedures in these manuals, where appropriate, but does not repeat them.

Cabletron Systems' **MMAC Overview and Setup Guide**

Cabletron Systems' **Ethernet Management Module (EMME) User's Guide**

Cabletron Systems' **EMM-E6 Local Management User's Guide**

1.9 GETTING HELP

If you need additional support related to the Cabletron Systems TPXMIM, or if you have any questions, comments, or suggestions related to this manual, contact Cabletron Systems Technical Support by:

Mail:	Cabletron Systems, Inc., P.O. Box 5005 Rochester, NH 03867-0505
Phone:	(603) 332-9400, Mon-Fri 8AM to 8PM EST
CompuServe®:	GO CTRON from any ! prompt
Internet Mail:	support@ctron.com

Before calling Cabletron Systems Technical Support, please have:

- a description of the failure
- a description of any action(s) already taken to resolve the problem (e.g., changing mode switches, rebooting the unit, etc.)
- a description of your network environment (layout, cable type, etc.)
- network load and frame size at the time of trouble (if known)
- the serial and revision numbers of all Cabletron products in the TPXMIM network
- the device history (i.e., have you returned the device before, is this a recurring problem, etc.)
- any previous Return Materials Authorization (RMA) numbers.

CHAPTER 2

SPECIFICATIONS/REQUIREMENTS

This chapter contains TPXMIM operating specifications and general 10BASE-T networking guidelines. Before attempting to install the TPXMIM or any additional EPIMs, review the requirements and specifications outlined in this chapter.

Caution: *Your network installation must meet the conditions, guidelines, specifications, and requirements included in this chapter to ensure satisfactory performance of this equipment. Failure to follow these guidelines may produce poor network performance.*

2.1 OPERATING SPECIFICATIONS

This section includes the operating specifications for the TPXMIM. Cabletron reserves the right to change these specifications at any time without notice.

Channels B/C Repeater Functionality

Preamble

Input:	Minimum of 40 bits. Maximum equals the number of bits received.
Output:	Minimum of 64 bits (last two bits are 1,1). Maximum equals the number of bits received plus 6.
JAM Output:	If a collision occurs on one of the segments, the TPXMIM sends a pattern of 1,0 to the other segments.

Minimum Packet Repeated:	96 bits including preamble (the TPXMIM extends packet fragments using the JAM [1,0] data pattern).
FAULT Protection:	Each segment disconnects itself from the other segments following 31 consecutive collisions, or if the collision detector of a segment remains ON longer than 110 µs. The TPXMIM automatically reconnects the problem segment after it transmits or receives one packet without a collision.

Environmental Requirements

Operating Temperature:	+5 to +40C (41° to 104°F)
Non-Operating Temperature:	-30 to +80C (-22° to 176°F)
Operating Humidity:	5 to 95% (non-condensing)

Safety

This unit meets safety requirements of UL 1950, CSA C22.2 No. 950, and EN 60950; the EMI requirements of FCC Class A and EN 55022 Class A; and the EMC requirements of EN 50082-1.

Warning: *It is the responsibility of the person who sells the system of which the TPXMIM will be a part to ensure that the total system meets allowed limits of conducted and radiated emissions.*

Physical

Dimensions:	34.04 D x 29.21 H x 5.08 W cm (13.4 D x 11.5 H X 2.0 W inches)
Weight:	~ 2 lbs.

2.2 TPXMIM NETWORK REQUIREMENTS

The following sections provide TPXMIM network port specifications.

2.2.1 TPXMIM-20/22 RJ45 Connector Specifications

The TPXMIM-20 and the TPXMIM-22 provide RJ45 connectors to attach twisted pair segments to the network. Figure 2-1 shows the pinouts for the RJ45 connectors.

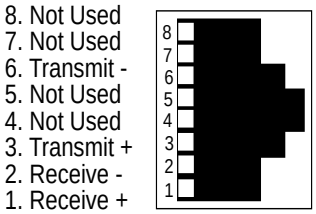

Figure 2-1. RJ45 Network Ports

2.2.2 TPXMIM-33/34 Champ Connector Specifications

The TPXMIM-33 and TPXMIM-34 provide 50-pin Champ connectors to attach twisted pair segments to the network as shown in Figure 2-2. Table 2-1 shows the pinouts for the Champ connector.

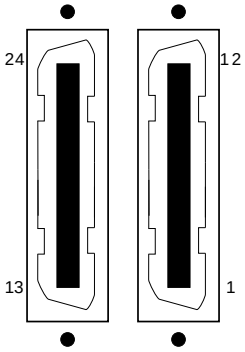

Figure 2-2. 50-Pin Champ Connectors

Table 2-1. 50-Pin Champ Connector Pinouts

Pin	Signal	Wire Color	Pin	Signal	Wire Color
1	RX 1-	Blue/White	26	RX 1+	White/Blue
2	TX 1-	Orange/White	27	TX 1+	White/Orange
3	RX 2-	Green/White	28	RX 2+	White/Green
4	TX 2-	Brown/White	29	TX 2+	White/Brown
5	RX 3-	Gray/White	30	RX 3+	White/Gray
6	TX 3-	Blue/Red	31	TX 3+	Red/Blue
7	RX 4-	Orange/Red	32	RX 4+	Red/Orange
8	TX 4-	Green/Red	33	TX 4+	Red/Green
9	RX 5-	Brown/Red	34	RX 5+	Red/Brown
10	TX 5-	Gray/Red	35	TX 5+	Red/Gray
11	RX 6-	Blue/Black	36	RX 6+	Black/Blue
12	TX 6-	Orange/Black	37	TX 6+	Black/Orange
13	RX 7-	Green/Black	38	RX 7+	Black/Green
14	TX 7-	Brown/Black	39	TX 7+	Black/Brown
15	RX 8-	Gray/Black	40	RX 8+	Black/Gray
16	TX 8-	Blue/Yellow	41	TX 8+	Yellow/Blue
17	RX 9-	Orange/Yellow	42	RX 9+	Yellow/Orange
18	TX 9-	Green/Yellow	43	TX 9+	Yellow/Green
19	RX 10-	Brown/Yellow	44	RX 10+	Yellow/Brown
20	TX 10-	Gray/Yellow	45	TX 10+	Yellow/Gray
21	RX 11-	Blue/Violet	46	RX 11+	Violet/Blue
22	TX 11-	Orange/Violet	47	TX 11+	Violet/Orange
23	RX 12-	Green/Violet	48	RX 12+	Violet/Green
24	TX 12-	Brown/Violet	49	TX 12+	Violet/Brown
25	N/C	Gray/Violet	50	N/C	Violet/Gray

2.3 NETWORK REQUIREMENTS

Take care in planning and preparing the cabling and connections for your network. The quality of the connections, the length of cables, and other conditions of the installation play critical roles in determining the reliability of your network. The following sections describe cable requirements for each media type.

2.3.1 10BASE-T Twisted Pair Network

When connecting a 10BASE-T Twisted Pair Segment at any of the 10BASE-T Twisted Pair hub interfaces (Ethernet Twisted Pair Segments [on the faceplate] or the Twisted Pair Ethernet Port Interface Module [EPIM-T]), ensure the network meets the following requirements:

- **Length** - The IEEE 802.3 10BASE-T standard requires that 10BASE-T devices transmit over a 100 meter (328 foot) link using 22-24 AWG unshielded twisted pair wire. However, cable quality largely determines maximum link length. If you use high quality, low attenuation cable, you can achieve link lengths of up to 200 meters. Cable delay limits maximum link length to 200 meters, regardless of the cable type.

  Note: *Losses introduced by connections at punch down blocks and other equipment reduce total segment length. For each connector or patch panel in the link, subtract 12 meters from the total length of your cable.*

- **Insertion Loss** - Between frequencies of 5.0 and 10.0 MHz, the maximum insertion loss must not exceed 11.5 dB. This includes the attenuation of the cables, connectors, patch panels, and reflection losses due to impedance mismatches in the link segment.

- **Impedance** - Cabletron Systems 10BASE-T Twisted Pair products work on twisted pair cable with 75 to 165 ohms impedance. Unshielded twisted pair cables typically have an impedance of between 85 to 110 ohms. You can also use shielded twisted pair cables, such as IBM Type 1 cable, but keep in mind that this cable has an impedance of 150 ohms.

The high impedance of the IBM Type 1 cable increases signal reflection. However, due to cable shielding, and the subsequent lack of crosstalk between shielded pairs, this signal reflection has little effect on the quality of the received signal.

- **Jitter** - Intersymbol interference and reflections can cause jitter in the bit cell timing, resulting in data errors. 10BASE-T links must not generate more than 5.0 nsec of jitter. Make sure your cable meets 10BASE-T link impedance requirements to rule out jitter as a concern.

- **Delay** - The maximum propagation delay of a 10BASE-T link segment must not exceed 1000 nsec. This 1000 nsec maximum delay limits the maximum link segment length to no greater than 200 meters.

- **Crosstalk** - Signal coupling between different cable pairs within a multi-pair cable bundle causes crosstalk. 10BASE-T transceiver design alleviates concerns about crosstalk, providing the cable meets all other requirements.

- **Noise** - Crosstalk, or externally induced impulses, can cause noise. Impulse noise may cause data errors if the impulses occur at very specific times during data transmission. Generally, noise is not a concern. If you suspect noise-related data errors, you may need to reroute the cable or eliminate the source of the impulse noise.

- **Temperature** - Multi-pair PVC 24 AWG telephone cables typically have an attenuation of approximately 8-10 dB/100 m at 20°C (68°F). The attenuation of PVC insulated cable varies significantly with temperature. At temperatures greater than 40°C (104°F), we strongly recommend using plenum-rated cable to ensure attenuation remains within specification.

2.3.2 Multimode Fiber Optic Network

When connecting a multimode fiber optic link segment to the hub (using an EPIM-F1/F2), ensure the network meets the following requirements:

- **Cable Type** - Use the EPIM-F1 and EPIM-F2 for the following multimode fiber optic media:

  - 50/125 μm fiber optic cabling
  - 62.5/125 μm fiber optic cabling
  - 100/140 μm fiber optic cabling

- **Attenuation** - You must test the fiber optic cable with a fiber optic attenuation test set adjusted for an 850 nm wavelength. This test verifies that the signal loss in a cable falls within the following acceptable levels:

  - 13.0 dB or less for a 50/125 μm fiber cable segment
  - 16.0 dB or less for a 62.5/125 μm fiber cable segment
  - 19.0 dB or less for a 100/140 μm fiber cable segment

- **Budget and Propagation Delay** - When you determine the maximum fiber optic cable length to incorporate fiber runs into your network, you must calculate and consider the fiber optic budget (a total loss of 10.0 dB or less is permissible between stations) and total network propagation delay.

  To determine the fiber optic budget, combine the optical loss due to the fiber optic cable, in-line splices, and fiber optic connectors. Typical loss for a splice and connector (together) equals 1 dB or less.

  Network propagation delay is the amount of time it takes a packet to travel from the sending device to the receiving device. Total propagation delay allowed for the entire network must not exceed 25.6 μsec in one direction (51.2 μsec round trip). If the total propagation delay between any two nodes on the network exceeds 25.6 μsec, you must use bridges.

- **Length** - The maximum possible multimode fiber optic cable length is 2 km (2187.2 yards). However, IEEE 802.3 FOIRL specifications specify a maximum of 1 km (1093.6 yards).

2.3.3 Single Mode Fiber Optic Network

When connecting a single mode fiber optic link segment to the hub (using an EPIM-F3), ensure the network meets the following requirements:

- **Cable Type** - Fiber optic link segments should consist of 8/125 to 12/125 µm single mode fiber optic cabling. You can also use 62.5/125 µm multimode cable with the EPIM-F3; however, use of multimode cable causes greater optical loss, and limits the possible distance to 2 km.

- **Attenuation** - You must test the fiber optic cable with a fiber optic attenuation test set adjusted for a 1300 nm wavelength. This test verifies that the signal loss in a cable falls within the acceptable level of 10.0 dB or less for any given single mode fiber optic link.

- **Budget and Propagation Delay** - When you determine the maximum fiber optic cable length to incorporate fiber runs into your network, you must calculate and consider the fiber optic budget (a total loss of 10.0 dB or less is permissible between stations) and total network propagation delay.

  To determine the fiber optic budget, combine the optical loss due to the fiber optic cable, in-line splices, and fiber optic connectors. Typical loss for a splice and connector (together) equals 1 dB or less.

  Network propagation delay is the amount of time it takes a packet to travel from the sending device to the receiving device. Total propagation delay for the entire network must not exceed 25.6 µsec in one direction (51.2 µsec round trip). If the total propagation delay exceeds 25.6 µsec, you must use bridges.

- **Length** - If you meet all system budgets, the maximum single mode fiber optic cable length can reach 5 km (3.1 miles) with bridges at each segment end. However, IEEE 802.3 FOIRL specifications specify a maximum of 1 km (1093.6 yards).

2.3.4 Thin-net Network

When connecting a thin-net (coaxial) segment to your hub (using an EPIM-C), ensure your network meets the following requirements:

- **Cable Type** - Use only 50 ohm RG-58A/U type coaxial cable for thin-net cable segments.

- **Length** - The thin-net segment must not exceed 185 meters.

- **Terminators** - Terminate each end of a thin-net segment.

- **Connectors** - You can use up to 29 tee-connectors throughout the length of the cable segment for host connections.

  If you use an excessive number of barrel connectors within the cable segment (e.g., finished wall plates with BNC feed-throughs), you may need to reduce the number of host connections. For special network design, contact Cabletron Systems Technical Support.

- **Grounding** - For safety, ground only **one** end of a thin-net segment. Do NOT connect EPIM BNC ports to earth ground.

  Warning: *Connecting a thin-net segment to earth ground at more than one point could produce dangerous ground currents.*

2.4 TRANSCEIVER REQUIREMENTS

When you connect an external network segment to an EPIM-A in your hub through a transceiver, that transceiver must meet IEEE 802.3 standards or Ethernet version 1.0 or 2.0 requirements. The transceiver must also have Signal Quality Error (SQE) disabled.

CHAPTER 3

INSTALLATION/CONFIGURATION

This chapter contains instructions for:

- unpacking the TPXMIM
- installing the TPXMIM into a Multi Media Access Center (MMAC)
- configuring the TPXMIM board or individual ports to run on MMAC backplane Channels
- adding/replacing optional Ethernet Port Interface Modules
- connecting your device to a network.

3.1 UNPACKING THE TPXMIM

Unpack the TPXMIM as follows:

1. Remove the shipping material covering the TPXMIM.
2. Carefully remove the module from the shipping box. Leave the module in its non-conductive bag until you are ready to install it.
3. Visually inspect the module. If you notice any signs of damage, contact Cabletron Systems Technical Support immediately.

3.2 INSTALLING THE TPXMIM

Installing the TPXMIM into any MMAC hub is an easy operation and requires no special skills or tools. However, when you install your device, keep the following in mind:

- You may install the TPXMIM in any slot except for slot 1 (farthest slot to the right) of the MMAC chassis.

- We suggest positioning the TPXMIM next to any contiguous RIC MIMs or MIMs directly controlled by the hub managing device (e.g., EMME, EMM-E6, etc.). This does not apply to shunting MMAC-FNBs, where the data path remains unbroken, and allows non-interrupted communication.

Caution: *Use all static precautions when handling boards.*

Install the TPXMIM into the MMAC-FNB (backplane) as follows:

1. Holding the TPXMIM by the front panel, or by the edges of the board, align the bottom and top edges of the board with the guide slots. Make sure that both of the edges of the card rest in the guide slots.

2. Slide the TPXMIM (Figure 3-1) into the desired slots of the MMAC card cage.

3. Firmly press the module connections into the backplane. Do not try to force the module into place or use the knurled knobs to draw the module into the backplane. Forcing a misaligned module into place can damage the TPXMIM or the MMAC backplane.

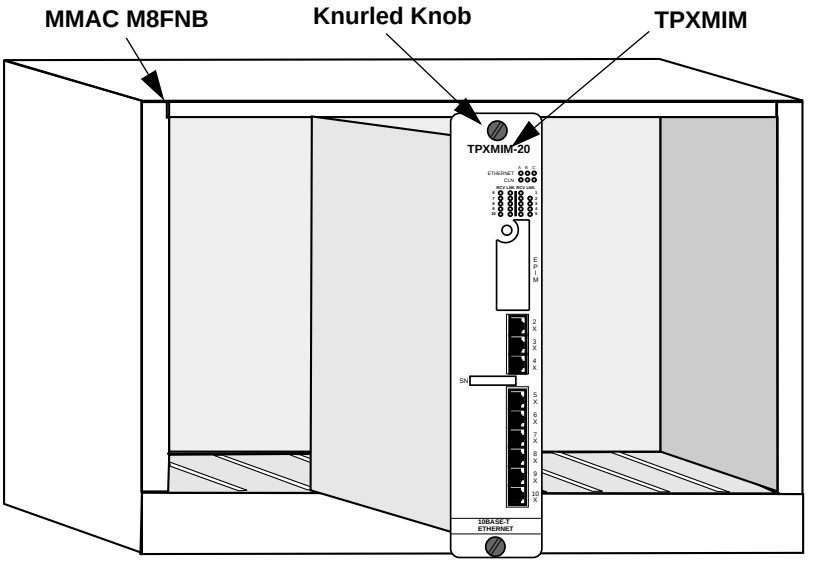

Figure 3-1. Installing the TPXMIM

4. Secure the module to the MMAC chassis by tightening the knurled knobs. If you do not tighten the knurled knobs, vibration can cause the module to lose contact with the backplane and disrupt your network.

5. Power-up the MMAC (if it isn't already **ON**).

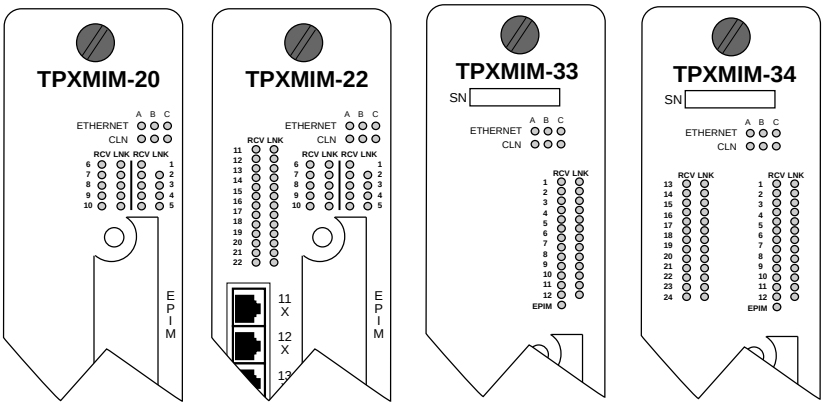

Figure 3-2. TPXMIM LANVIEW LEDs

After the system boot procedure, the LEDs (see Figure 3-2) should be in the following conditions:

- Ethernet Channel LEDs ON or OFF, depending on the port connection status.

  Note: *TPXMIM defaults to CH B on initial power-up.*

- Appropriate EPIM LEDs ON (see section 3.5, **Connecting to the Network**, to obtain the appropriate LED status for EPIMs).

- Appropriate RCV LEDs flashing and LNK LEDs ON to show connection of individual ports.

3.3 CONFIGURING BOARDS AND PORTS

The TPXMIM provides state of the art flexibility by allowing you to assign whole boards or individual ports to any MMAC Channel (i.e., Channel A, B, or C). In other words, you can:

- assign an entire TPXMIM to any one Channel
- assign any number of individual TPXMIM ports to any Channel.

This flexibility provides the advantage of grouping users together based on file server or network usage, ultimately maximizing the use of bandwidth. In addition, since the TPXMIM uses only one slot, a single MMAC can contain up to 168 user ports while providing bridging and routing capabilities.

Setting TPXMIM boards or individual ports to a specific MMAC Channel requires the use of a MIB walking tool and access through a multi-channel management device (i.e., EMME, EMM-E6, etc.). In other words, you must set specific MIB instances pertaining to the TPXMIM board as a whole or the individual ports.

You can set MIBs using a number of MIB walking tools. This manual describes how to set the MIBs using the SNMP Tools screen in EMME or EMM-E6 Local Management. For additional information regarding the SNMP Tools screen, refer to the **EMME User's Guide** or the **EMM-E6 Local Management Guide**.

3.3.1 Assigning an Entire TPXMIM Board

The TPXMIM allows the options of assigning an entire board to an individual MMAC Channel (i.e., Channel A, B, or C). Assigning an entire board overrides any port local assignments that may have been set. To assign an entire TPXMIM board, refer to the following instructions and set the MIB using the desired variable.

To assign an entire board:

1. From the SNMP Tools screen, highlight **SET**, using the arrow keys.

2. Press the **Return** key. SNMP Tools screen displays the following:

   <SET> OID (=|F9):

3. Enter the following OID string:

   4.1.52.1.6.1.2.2.1.1.2.**MMAC Slot #**.0

   Note: *Enter the number of the slot (i.e., slot 2-3 for an MMAC-3, 2-5 for an MMAC-5, or 2-8 for an MMAC-8) holding the TPXMIM in the space indicated by bold text. When entering this OID string, remember the following:*

   - *MMAC slots increment from right to left*
   - *the farthest right slot (#1) contains the multichannel management module*
   - *in this example, the **SET** command takes into account the 1.3.6.1 prepend.*

4. Press the **Return** key. The SNMP Tools Screen displays:

   {INteger String Null OId IP address Counter Guage Timeticks OPaque} DATA TYPE (name):

5. Enter “IN” for an integer data type.

6. Press the **Return** key. The SNMP Tools screen displays:

   SNMP OID DATA:

7. Enter the integer for the desired Channel assignment. The following table provides a Channel to integer association.

MMAC Channel	OID Integer (Instance)
A	4
B	1
C	2

8. Press the **Return** key. If the device accepts the entry, it displays:

   <SET> OPERATION CODE: XXXX <OK>

   If the module does not accept the entry, and an error message appears, begin with step #1 again and re-enter the information. If the module still refuses to accept the entry, contact Cabletron Technical Support.

3.3.2 Assigning Individual TPXMIM Ports

The TPXMIM allows the option of assigning individual ports to a specific MMAC Channel (i.e., Channel A, B, or C). To assign an individual TPXMIM port, refer to the following instructions and set the MIB using the desired variable.

To assign an individual port:

1. From the SNMP Tools screen, highlight **SET**, using the arrow keys.

2. Press the **Return** key. SNMP Tools screen displays the following:

   <SET> OID (=|F9):

3. Enter the following OID string:

   4.1.52.1.6.1.2.3.1.1.3.**MMAC Slot #.TPXMIM Port #**.0

   Note: *Enter the number of the slot (i.e., slot 2-3 for an MMAC-3, 2-5 for an MMAC-5, or 2-8 for an MMAC-8) holding the TPXMIM, and the number of the port you want to assign, in the spaces indicated by bold text. When entering this OID string, remember the following:*

   - *MMAC slots increment from right to left*
   - *the farthest right slot (#1) contains the multichannel management module*
   - *each TPXMIM displays port numbering on its faceplate*
   - *in this example, the* ***SET*** *command takes into account the 1.3.6.1 prepend.*

4. Press the **Return** key. The SNMP Tools Screen displays:

   {INteger String Null OId IP address Counter Guage Timeticks OPaque} DATA TYPE (name):

5. Enter “IN” for an integer data type.

6. Press the **Return** key. The SNMP Tools screen displays:

   SNMP OID DATA:

7. Enter the integer for the desired Channel assignment. The following table provides a Channel to integer association.

MMAC Channel	OID Integer (Instance)
A	1
B	2
C	3

8. Press the **Return** key. If the device accepts the integer entry, the SNMP Tools screen displays:

   <SET> OPERATION CODE: XXXX <OK>

   If the module does not accept the entry, and an error message appears, begin with step #1 again and re-enter the information. If the module still refuses to accept the entry, contact Cabletron Technical Support.

3.4 ADDING/REPLACING EPIMs

This section contains procedures on how to add/replace an Ethernet Port Interface Module (EPIM) to upgrade or change the capabilities of your hub. After installing your new EPIM, refer to appropriate EPIM sections in this chapter to verify proper operation.

Caution: *Observe all static precautions while handling EPIMs.*

To add/replace an EPIM:

Note*: When removing an EPIM, be sure to pull the module straight out so as not to damage the connector.*

1. Remove the coverplate or the EPIM (whichever applies).

2. Slide your new EPIM into place, making sure the connectors on the rear of the module and inside the TPXMIM attach properly.

3. Install the mounting screw.

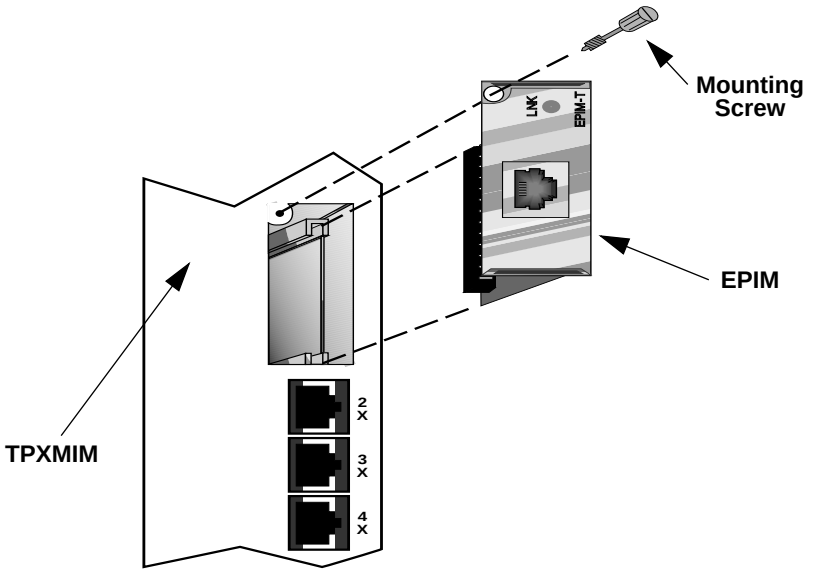

Figure 3-3. Installing an EPIM

3.5 CONNECTING TO THE NETWORK

This section describes the various connection types for the TPXMIMs and each optional EPIM. The procedure for connecting Ethernet segments to a module or an EPIM varies depending on the media type. Refer to the list below and follow the procedures in the appropriate subsection:

- TPXMIM 20/22 3.5.1
- TPXMIM 33/34 3.5.2
- EPIM-T 3.5.3
- EPIM-X 3.5.4
- EPIM-F1, F2, F3 3.5.5
- EPIM-C 3.5.6
- EPIM-A 3.5.7

3.5.1 Attaching a Twisted Pair Segment to the TPXMIM-20/22

The TPXMIM-20 has nine RJ45 twisted pair ports and the TPXMIM-22 has twenty-one RJ45 twisted pair ports. The TPXMIM-20 and TPXMIM-22 have a Polarity Correction and Detection feature which allows packets to pass even if the polarity of the twisted pair is reversed.

To attach twisted pair segments to the network ports:

1. Insert the RJ45 connector from each twisted pair segment into the desired network port on the TPXMIM as shown in Figure 3-4.

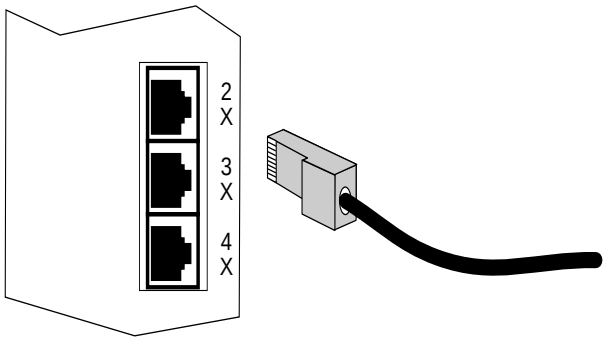

Figure 3-4. TPXMIM-20/22 Network Ports

2. At the device end of a segment, attach the segment to a 10BASE-T compliant Ethernet device.

3. Check that the **LNK** (link) LED on the 10BASE-T Ethernet device and the **LNK** LED on the TPXMIM are **ON**. If the LEDs are not **ON**, perform each of the following steps until they are:

    a. Check that the 10BASE-T device and the MMAC have power.

    b. Verify the cabling between the TPXMIM and the device.

    c. Check the cable for continuity.

If you cannot establish link, contact Cabletron Technical Support.

3.5.2 Attaching a Twisted Pair Segment to the TPXMIM-33/34

The TPXMIM-33 has one 50-pin Champ connector and the TPXMIM-34 has two 50-pin Champ connectors. This configuration of the TPXMIM allows you to run a 50-pin feeder cable from the TPXMIM to a punch down block. Each Champ connector can accommodate twelve 10BASE-T, twisted pair segments.

The TPXMIM 34 provides the option of using all twenty-four 10Base-T twisted pair segments or using twenty-three twisted pair segments and the optional EPIM for a total of twenty-four active ports.

Note: *Refer to* ***Appendix A*** *for information about wiring to a Punch Down block.*

The TPXMIM-33 and TPXMIM-34 have a Polarity Correction and Detection feature which allows packets to pass under conditions of reverse polarity.

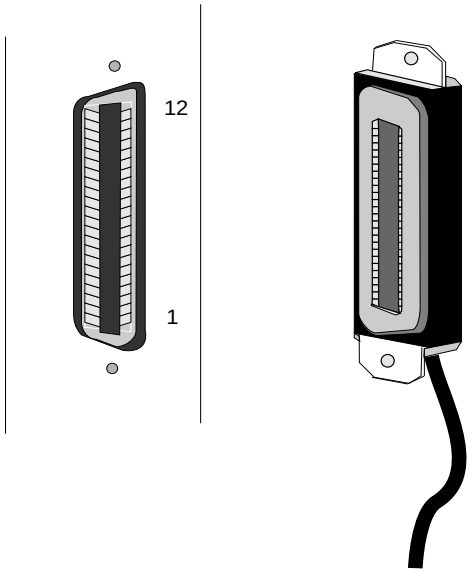

Figure 3-5. 50-Pin Champ Connector

To connect the TPXMIM-33/34 into an existing twisted pair wiring system:

1. Connect a 50-pin feeder cable to the Champ connector on the TPXMIM. See Figure 3-5.

2. Attach the feeder cable to the punch down block, or patch panel. If using a TPXMIM-34, you can connect a second 50-pin feeder cable to the module.

   In most cases, connect the feeder cable directly to a Champ connector located on the punch down block. If not, wire the feeder cable to the punch down block using the punch down information in Appendix A.

3. At the device end of a segment, attach the segment to a 10BASE-T compliant Ethernet device.

4. Check that the **LNK** (link) light on the 10BASE-T Ethernet device and the **LNK** LED on the TPXMIM are **ON**. If the LEDs are not **ON**, perform each of the following steps until they are:

   a. Check that the 10BASE-T device and the MMAC have power.

   b. Verify the cabling between the module and the 10BASE-T device.

   c. Check the cable for continuity.

If you cannot establish link, contact Cabletron Technical Support.

3.5.3 Connecting a Twisted Pair Segment to an EPIM-T

Before connecting a segment to the EPIM-T, check each end of the segment to determine wire cross-over. If the wires do not cross over, use the switch on the EPIM-T to internally cross over the RJ45 port. Refer to Figure 3-6 to properly set the EPIM-T cross-over switch.

Note: *To establish link, you must have an odd number of cross-overs (preferably one) between 10BASE-T devices of the same type (i.e., from repeater to repeater or transceiver to transceiver).*

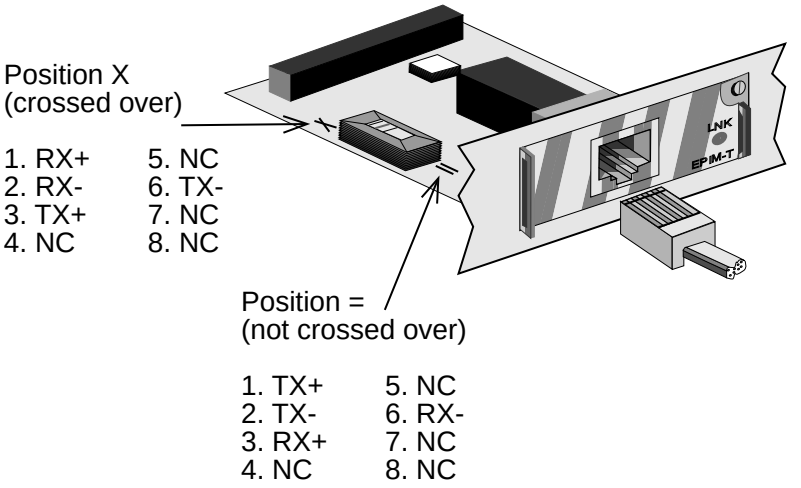

Figure 3-6. EPIM-T Cross-over Switch

To connect an EPIM-T to a Twisted Pair Segment:

1. Connect the twisted pair segment to the module by inserting the RJ45 connector on the twisted pair segment into the RJ45 port on the module. (See Figure 3-7.)

2. Check that the **LNK** LED for the port is **ON**. If the LED is not **ON**, perform each of the following steps until it is:

   a. Check that the 10BASE-T device at the other end of the twisted pair segment is powered.

   b. Verify that the RJ45 connectors on the twisted pair segment have the proper pinouts. (See Figure 3-7.)

   c. Check the cable for continuity.

   d. Check that the twisted pair connection meets dB loss and cable specifications outlined in 10BASE-T Twisted Pair Network Requirements (Chapter 2).

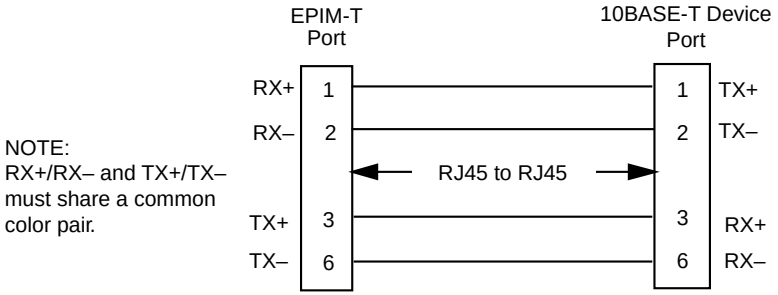

Figure 3-7. Cable Pinouts - EPIM-T RJ45 Port

If you still cannot establish link, contact Cabletron Technical Support.

3.5.4 Connecting an AUI Cable to an EPIM-X

Caution: *The Signal Quality Error (SQE) switch remains in the OFF position for most network connections. However, some Data Terminal Equipment (DTE) requires SQE. Refer to your DTE manual for SQE requirement information.*

To connect an EPIM-X to a device not requiring SQE:

1. Check that the **SQE** LED on the EPIM-X is **OFF**. If the **SQE** LED is **ON**, check the position of the SQE switch.

   Note: *If the SQE light remains **ON**, even though the SQE switch is in the **OFF** position, contact Cabletron Technical Support.*

2. Attach one end of an AUI cable, no longer than 50 meters in length, to the port located on the EPIM-X (Figure 3-8) and the other end to the intended node.

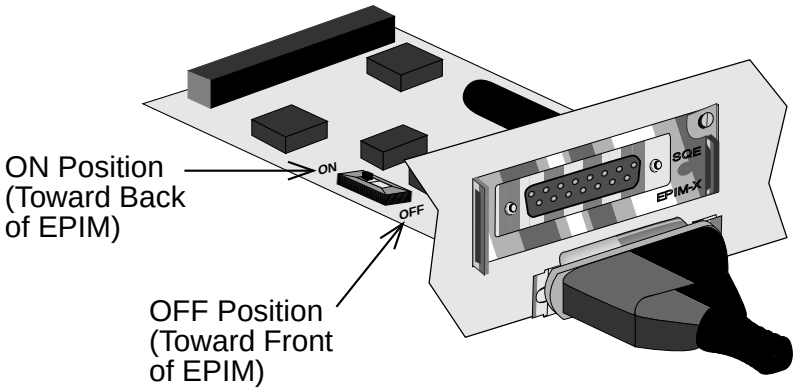

Figure 3-8. EPIM-X

3.5.5 Connecting a Fiber Optic Cable to an EPIM-F1/F2, or EPIM-F3

When connecting a fiber optic link segment to an EPIM-F1/F2, or EPIM-F3 keep the following in mind:

- When connecting a fiber optic link segment with SMA 906 connectors to an EPIM-F1 with SMA ports, make sure each connector uses half alignment, NOT full alignment, sleeves.

  Warning: *A full alignment sleeve damages the receive port. SMA 905 connectors do not need alignment sleeves.*

- When connecting a fiber optic link segment with ST connectors to an EPIM-F2 with ST ports, keep in mind that ST connectors attach to ST ports much like BNC connectors attach to BNC ports. Insert the connector into the port with the alignment key on the connector inserted into the alignment slot on the port. Turn the connector to lock it down.

- The physical communication link consists of two strands of fiber optic cabling: the Transmit (TX) and the Receive (RX). The Transmit strand from a module port connects to the Receive port of a fiber optic Ethernet device at the other end of the segment (i.e., TX of the applicable port on the module goes to RX of the other fiber optic device). The Receive strand of the applicable port on the module connects to the Transmit port of the fiber optic Ethernet device (i.e., RX of the applicable port on the module goes to TX of the other fiber optic device).

  We recommend labeling fiber optic cables to indicate Receive and Transmit ends. Cabletron Systems prelabels its cable. At one end of the cable, one fiber is labeled 1, and the other fiber is labeled 2. This pattern repeats at the other end of the cable. When not purchasing cable from Cabletron Systems, label your cable in this manner.

> ***Caution:*** *Do not touch the ends of the fiber optic strands, and do not let the ends come in contact with dust, dirt, or other contaminants. Contamination of cable ends causes problems in data transmissions. If necessary, clean contaminated cable ends using alcohol and a soft, clean, lint-free cloth.*

To connect a fiber optic link segment to an EPIM-F1/F2 or an EPIM-F3:

1. Remove the protective plastic covers from the fiber optic ports on the applicable port on the module, and from the ends of the connectors on each fiber strand.

2. Attach the fiber labeled 1 to the applicable receive port (RX) on the module. (See Figure 3-9.)

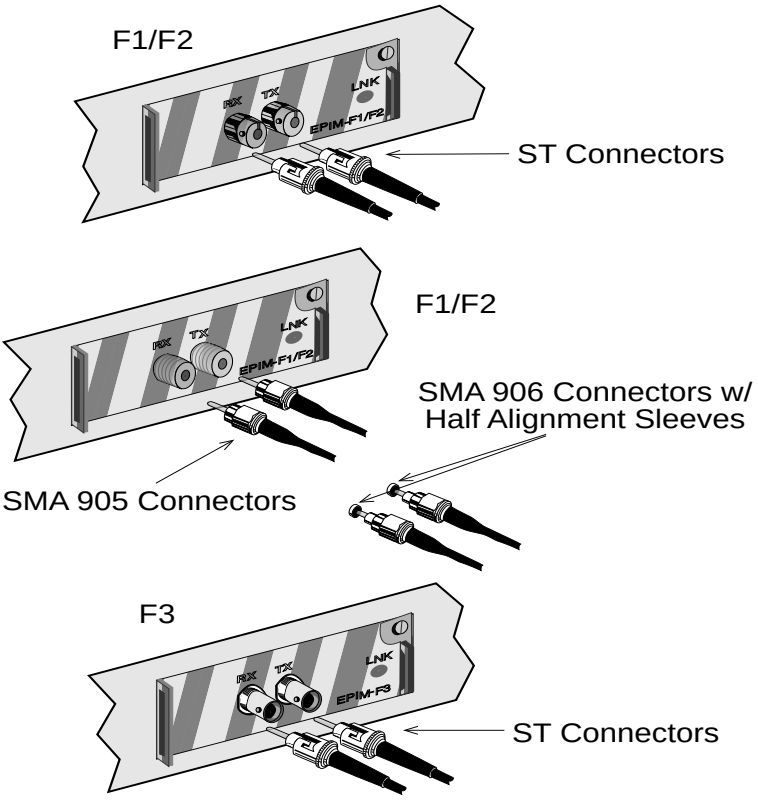

Figure 3-9. EPIM-F1/F2 and EPIM-F3

3. Attach the fiber labeled 2 to the applicable transmit port (TX) on the module.

4. At the other end of the fiber optic cable, attach the fiber labeled 1 to the transmit port of the device.

5. Attach the fiber labeled 2 to the receive port.

6. Check that the **LNK** LED on the applicable module port is **ON**. If the LED is not **ON**, perform each of the following steps until it is:

   a. Check that the device at the other end of the link is powered.

   b. Verify proper "cross-over" of fiber strands between the applicable port on the module and the fiber optic device at the other end of the fiber optic link segment.

   c. Verify that the fiber connection meets the dB loss specifications outlined in Fiber Optic Network Requirements (Chapter 2).

If you still cannot establish link, contact Cabletron Technical Support.

3.5.6 Connecting a Thin-Net Segment to an EPIM-C

To connect a thin-net segment to an EPIM-C:

1. Set the Internal Termination Switch (Figure 3-10), located to the left of the port and labeled **TERM** to:

   - the **ON** position (●) to internally terminate the thin-net segment at the port.

   - the **OFF** position (❍) if you do not want the thin-net segment to internally terminate at the port.

2. If the Internal Termination Switch is in the **ON** position, connect the thin-net segment directly to the BNC port.

3. If the Internal Termination switch is in the **OFF** position:

   a. Attach a BNC tee-connector to the BNC port on the module.

   b. Attach the thin-net segment to one (1) of the female connectors on the tee-connector.

   Caution: *Failure to terminate each tee-connector segment may result in improper segment operation. Place a terminator on any open female connection on the tee-connector.*

   c. Attach another thin-coax segment or a terminator to the other female connector on the tee-connector.

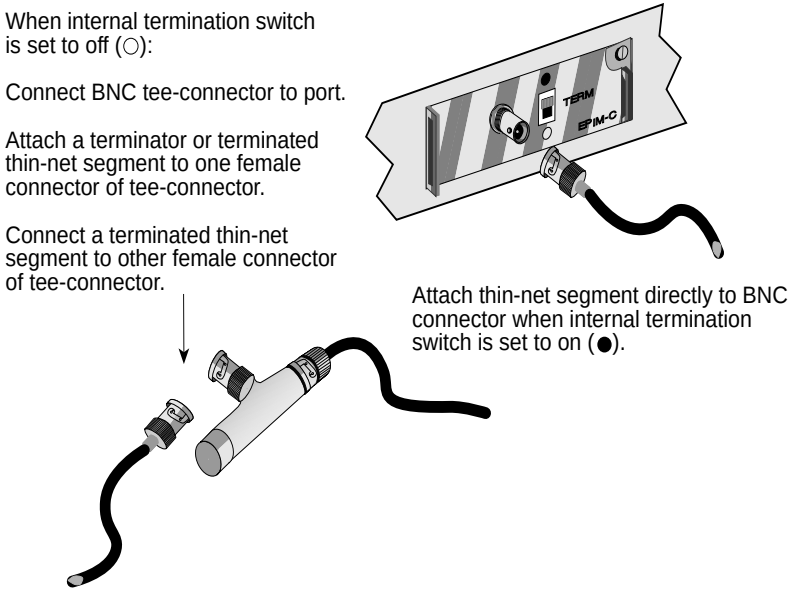
When internal termination switch is set to off (○):
Connect BNC tee-connector to port.
Attach a terminator or terminated thin-net segment to one female connector of tee-connector.
Connect a terminated thin-net segment to other female connector of tee-connector.
TERM
EPIM-C
Attach thin-net segment directly to BNC connector when internal termination switch is set to on (●).

Figure 3-10. EPIM-C

3.5.7 Connecting an AUI Cable to an EPIM-A

Caution: *Ensure that the external transceiver to which the EPIM-A connects does not have the Signal Quality Error (SQE or "heartbeat") test function enabled. The EPIM does not operate if the transceiver has the SQE test function enabled. Refer to the applicable transceiver manual for additional information.*

To connect an EPIM-A to an external network segment:

1. Check that the **PWR** LED on the EPIM-A is **ON**. If the **PWR** LED is **OFF**, contact Cabletron Systems Technical Support.

2. Attach an external transceiver to the network segment intended for AUI port connection. For additional information, refer to the applicable transceiver manual.

3. Attach an AUI cable, no longer than 50 meters in length, to the external transceiver.

4. Connect the AUI cable to the AUI port located on the EPIM-A. (See Figure 3-11.)

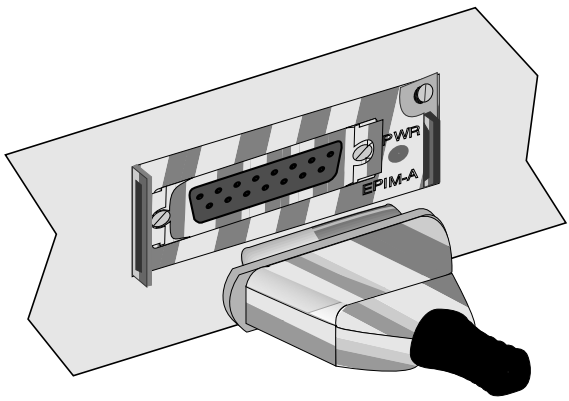

Figure 3-11. EPIM-A

5. Lock the AUI connector into place using the connector slide latch.

6. If the transceiver **PWR** LED is **OFF** with the AUI cable connected:

    a. Check the AUI connections for proper pinouts. Appendix B lists the pinouts for the transceiver connection.

    b. Check the cable for continuity.

    c. Reconnect the AUI cable to the TPXMIM and the device.

If the transceiver **PWR** LED remains **OFF**, contact Cabletron Systems Technical Support.

CHAPTER 4

TESTING/TROUBLESHOOTING

This chapter includes information for testing your TPXMIM before and after connecting it to your network, and troubleshooting network and TPXMIM operational problems.

4.1 PRE-INSTALLATION TEST

Before installing the TPXMIM in a live network, test the module in a controlled situation to ensure that it is repeating packets. This test requires an MMAC containing an EMME (or equivalent multichannel management module) and the TPXMIM. You perform the test with two workstations (Figure 4-1).

1. Install the EMME and the TPXMIM into a stand-alone MMAC.

2. Connect the first workstation to either the TPXMIM, using the appropriate cable and transceiver, or to the EMME through the active AUI port (normally AUI 1).

   Note: *The EMME uses the AUI 1 port as the default active bridge port. If you want to test modules using the AUI 2 port, you must select that port using EMME Local Management.*

3. Connect the second workstation to the TPXMIM, using the appropriate transceivers and cable.

4. Set the first workstation as the file server and the second as the client (refer to specific workstation documentation for setting file server and client). After setting up the workstations, send packets between the workstations and verify that the module operates properly.

If failures occur, contact Cabletron Technical Support.

Note: *A "ping" test verifies that the TPXMIM is operating properly.*

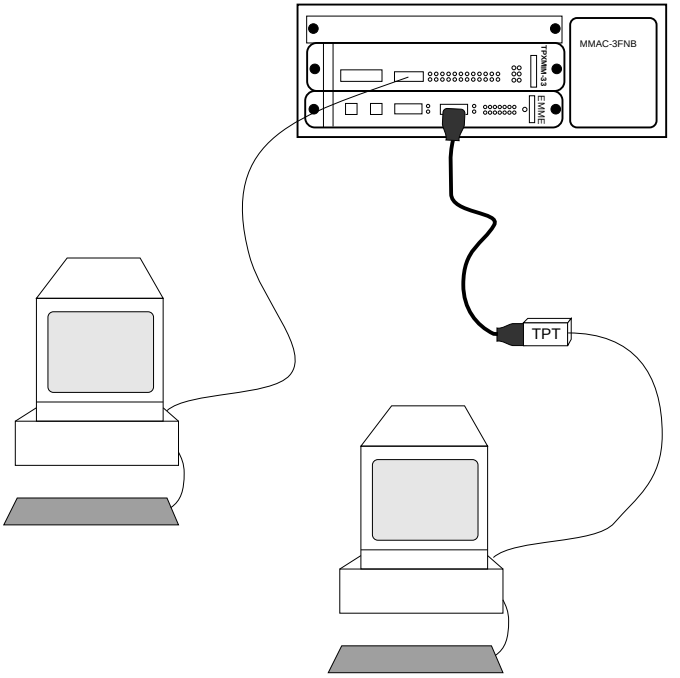

Figure 4-1. Pre-installation Test

4.2 INSTALLATION CHECK-OUT

After connecting the EMME to the network, verify that the two Ethernet network segments can pass packets using the EMME. Again you can use two workstations set up as file server and client. Keep the server workstation stationary in the wiring closet with the EMME, and move the client workstation to each TPXMIM node (Figure 4-2).

1. Connect the server workstation to either the TPXMIM, using the appropriate cable and transceiver, or to an EMME AUI port, using a transceiver and an AUI cable.

2. Connect the client workstation to each node and test the segment.

If failures occur, contact Cabletron Systems Technical Support.

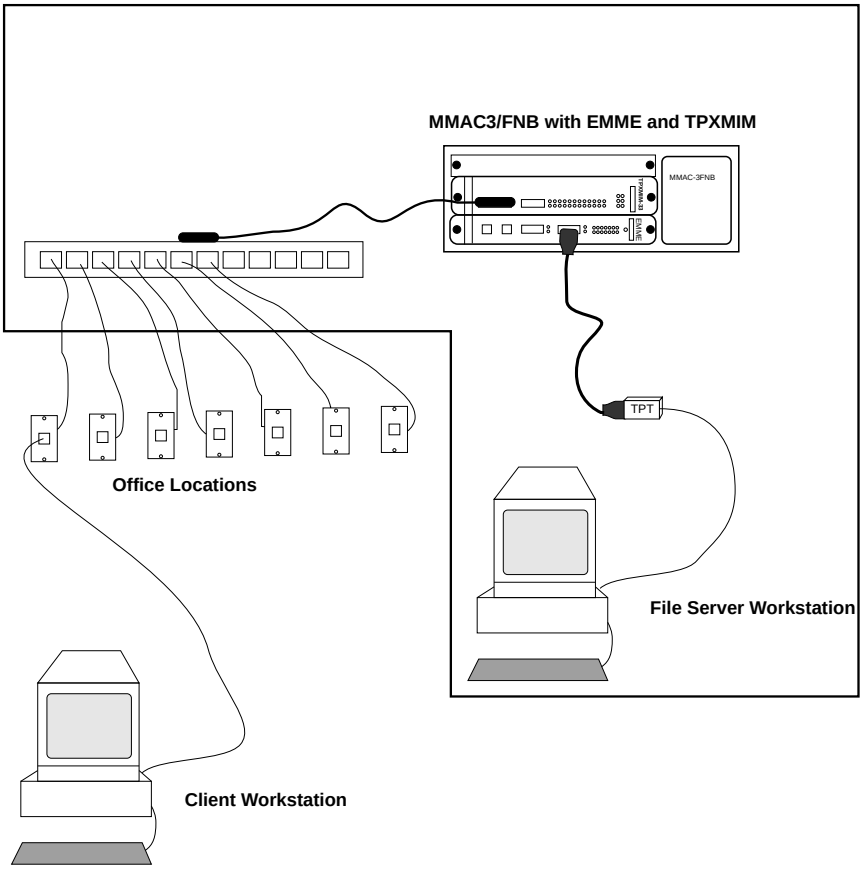

Figure 4-2. Installation Check-Out

4.3 USING LANVIEW

The TPXMIM uses the Cabletron Systems built-in visual diagnostic and status monitoring system called LANVIEW. With LANVIEW, you can quickly scan the TPXMIM LEDs to observe network status or diagnose network problems.

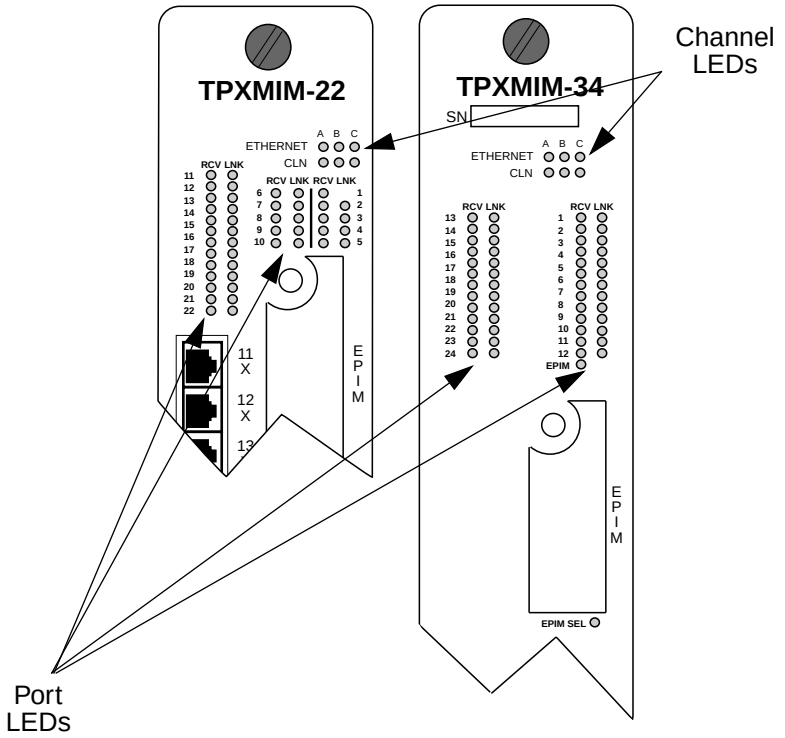

Figure 4-3. LANVIEW LEDs

Table 4-1. TPXMIM LANVIEW LEDs

LED	Color	Description	Error Condition/ Recommended Action
Ethernet Channels (A, B, C)	Green	When ON, these LEDs indicate that at least one TPXMIM port accesses that Channel. The TPXMIM can have all LEDs ON at the same time.	The TPXMIM defaults to Channel B on power-up. If the Channel B LED remains off after powering the TPXMIM, contact Cabletron Technical Support. If you assign a board or individual port to another Channel, and the Ethernet LED remains OFF, contact Cabletron Technical Support.
CLN (Collision)	Red	LED flashes to indicate the occurence of collisions on the port. Collisions normally occur on an Ethernet Network.	Flash frequency may increase with increased network activity. Excessive collisions indicate too much traffic on a segment. Reduce traffic on that segment.
RCV (Receive) EPIM RCV (Receive) **TPXMIM-33/34**	Yellow	Light flashes to indicate that a segment is receiving a frame.	If none of the receive LEDs are flashing, the TPXMIM is not receiving frames on any of the segments. Check that each module is firmly installed in the MMAC. Ensure that all connected ports are enabled.

Table 4-1. TPXMIM LANVIEW LEDs (Continued)

LED	Color	Description	Error Condition/ Recommended Action
EPIM SEL (Select) **TPXMIM-33**	Green	This LED is ON as long as power is applied. The EPIM on the TPXMIM-33 is always selected (all ports are active).	If the LED remains OFF after powering the TPXMIM, contact Cabletron Technical Support.
EPIM SEL (Select) **TPXMIM-34**	Green	This LED indicates port association selection of the EPIM port instead of 10BASE-T port 13.	This LED is ON only if the EPIM is selected by assigning it to a specific Ethernet Channel. Select the EPIM through the use of a MIB walking tool and an MMAC (see Chapter 3). If you cannot select the EPIM, contact Cabletron Technical Support.
LNK (Link)	Green	When ON, this LED indicates a port has obtained a link with the device at the other end of the attached segment. This LED remains ON as long as the link is maintained.	If the LED remains OFF, check the cable integrity, and that the device on the other end of the cable is ON. If you cannot obtain link, contact Cabletron Technical Support.

4.4 TROUBLESHOOTING CHECKLIST

If your TPXMIM is not operating properly, the following checklist describes some of the problems that may occur with the module, possible causes for the problem, and suggestions for resolving the problem.

Table 4-2. Troubleshooting Checklist

Problem	Possible Causes	Recommended Action
All LEDs are OFF.	Loss of Power to the MMAC. TPXMIM not properly installed.	Check the proper installation of the MMAC power supply module and its access to a live outlet. Check that the MMAC has adequate power. Some configurations, especially those including FDDI modules, require that the MMAC contain more than one power supply. Check to see that the power supply LEDs are green.
Cannot assign the TPXMIM board or individual ports from in-band management.	No link to device.	Refer to the Local Management Guide for the multichannel management module controlling the MMAC, and ensure you are using the MIB walking tool properly. Check link to device.
No power to an external transceiver connected to the EPIM port.	EPIM is defective. EPIM cable is defective.	Replace EPIM. Replace EPIM cable.
High number of collisions on EPIM port.	External transceiver has SQE enabled.	Disable SQE.

APPENDIX A

TWISTED PAIR WIRING TABLES

This appendix contains twisted pair wiring tables to assist you when using a punch down block (see Figure A-1) to wire your twisted pair segments. This appendix includes the following tables:

- Table A-1 Twisted Pair Wiring from a Punch Down Block to a 10BASE-T Device
- Table A-2 Twisted Pair Wiring Summary

Table A-1. Twisted Pair Wiring
From a Punch Down Block to a 10Base-T Device

From Punch Down Block		To RJ45 Wallplate	Into Office Drop	Into 10BASE-T Device
Port 12/24		Pin	Pin	Pin
B45 Violet/Green	RX+	1 TX+	1 TX+	1 TX+
B46 Green/Violet	RX-	2 TX-	2 TX-	2 TX-
B47 Violet/Brown	TX+	3 RX+	3 RX+	3 RX+
B48 Brown/Violet	TX-	6 RX-	6 RX-	6 RX-
Port 11/23		Pin	Pin	Pin
B41 Violet/Blue	RX+	1 TX+	1 TX+	1 TX+
B42 Blue/Violet	RX-	2 TX-	2 TX-	2 TX-
B43 Violet/Orange	TX+	3 RX+	3 RX+	3 RX+
B44 Orange/Violet	TX-	6 RX-	6 RX-	6 RX-
Port 10/22		Pin	Pin	Pin
B37 Yellow/Brown	RX+	1 TX+	1 TX+	1 TX+
B38 Brown/Yellow	RX-	2 TX-	2 TX-	2 TX-
B39 Yellow/Gray	TX+	3 RX+	3 RX+	3 RX+

Table A-1. Twisted Pair Wiring
From a Punch Down Block to a 10Base-T Device (Continued)

From Punch Down Block	To RJ45 Wallplate	Into Office Drop	Into 10BASE-T Device
B40 Gray/Yellow TX-	6 RX-	6 RX-	6 RX-
Port 9/21	Pin	Pin	Pin
B33 Yellow/Orange RX+	1 TX+	1 TX+	1 TX+
B34 Orange/Yellow RX-	2 TX-	2 TX-	2 TX-
B35 Yellow/Green TX+	3 RX+	3 RX+	3 RX+
B36 Green/Yellow TX-	6 RX-	6 RX-	6 RX-
Port 8/20	Pin	Pin	Pin
B29 Black/Gray RX+	1 TX+	1 TX+	1 TX+
B30 Gray/Black RX-	2 TX-	2 TX-	2 TX-
B31 Yellow/Blue TX+	3 RX+	3 RX+	3 RX+
B32 Blue/Yellow TX-	6 RX-	6 RX-	6 RX-
Port 7/19	Pin	Pin	Pin
B25 Black/Green RX+	1 TX+	1 TX+	1 TX+
B26 Green/Black RX-	2 TX-	2 TX-	2 TX-
B27 Black/Brown TX+	3 RX+	3 RX+	3 RX+
B28 Brown/Black TX-	6 RX-	6 RX-	6 RX-
Port 6/18	Pin	Pin	Pin
B21 Black/Blue RX+	1 TX+	1 TX+	1 TX+
B22 Blue/Black RX-	2 TX-	2 TX-	2 TX-
B23 Black/Orange TX+	3 RX+	3 RX+	3 RX+
B24 Orange/Black TX-	6 RX-	6 RX-	6 RX-
Port 5/17	Pin	Pin	Pin
B17 Red/Brown RX+	1 TX+	1 TX+	1 TX+

Table A-1. Twisted Pair Wiring
From a Punch Down Block to a 10Base-T Device (Continued)

From Punch Down Block			To RJ45 Wallplate	Into Office Drop	Into 10BASE-T Device
B18	Brown/Red	RX-	2 TX-	2 TX-	2 TX-
B19	Red/Gray	TX+	3 RX+	3 RX+	3 RX+
B20	Gray/Red	TX-	6 RX-	6 RX-	6 RX-
Port 4/16			Pin	Pin	Pin
B13	Red/Orange	RX+	1 TX+	1 TX+	1 TX+
B14	Orange/Red	RX-	2 TX-	2 TX-	2 TX-
B15	Red/Green	TX+	3 RX+	3 RX+	2 TX-
B16	Green/Red	TX-	6 RX-	6 RX-	6 RX-
Port 3/15			Pin	Pin	Pin
B9	White/Gray	RX+	1 TX+	1 TX+	1 TX+
B10	Gray/White	RX-	2 TX-	2 TX-	2 TX-
B11	Red/Blue	TX+	3 RX+	3 RX+	3 RX+
B12	Blue/Red	TX-	6 RX-	6 RX-	6 RX-
Port 2/14			Pin	Pin	Pin
B5	White/Green	RX+	1 TX+	1 TX+	1 TX+
B6	Green/White	RX-	2 TX-	2 TX-	2 TX-
B7	White/Brown	TX+	3 RX+	3 RX+	3 RX+
B8	Brown/White	TX-	6 RX-	6 RX-	6 RX-
Port 1/13			Pin	Pin	Pin
B1	White/Blue	RX+	1 TX+	1 TX+	1 TX+
B2	Blue/White	RX-	2 TX-	2 TX-	2 TX-
B3	White/Orange	TX+	3 RX+	3 RX+	3 RX+
B4	Orange/White	TX-	6 RX-	6 RX-	6 RX-

Table A-2. Twisted Pair Wiring Summary

TPXMIM 33/34 Champ		Punch Down Block		Wall Plate (If Required)		10BASE-T Ethernet Device
Port 12						
48 RX+		A45 RX+		PIN 1 TX+		PIN 1 TX+
23 RX-	25 Pin Feeder Cable	A46 RX-	4 Pair Twisted Distribution Cable	PIN 2 TX-	Office Drop	PIN 2 TX-
49 TX+		A47 TX+		PIN 3 RX+		PIN 3 RX+
24 TX-		A48 TX-		PIN 6 RX+		PIN 6 RX+
Port 11						
46 RX+		A41 RX+		PIN 1 TX+		PIN 1 TX+
21 RX-	25 Pin Feeder Cable	A42 RX-	4 Pair Twisted Distribution Cable	PIN 2 TX-	Office Drop	PIN 2 TX-
47 TX+		A43 TX+		PIN 3 RX+		PIN 3 RX+
22 TX-		A44 TX-		PIN 6 RX-		PIN 6 RX-
:		:		:		:
:		:		:		:
:		:		:		:
:		:		:		:
:		:		:		:
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:		:		:		:
:		:		:		:
:		:		:		:
:		:		:		:
:		:		:		:
Port 1						
26 RX+		A1 RX+		PIN 1 TX+		PIN 1 TX+
1 RX-	25 Pin Feeder Cable	A2 RX-	4 Pair Twisted Distribution Cable	PIN 2 TX-	Office Drop	PIN 2 TX-
27 TX+		A3 TX+		PIN 3 RX+		PIN 3 RX+
2 TX-		A4 TX-		PIN 6 RX-		PIN 6 RX-

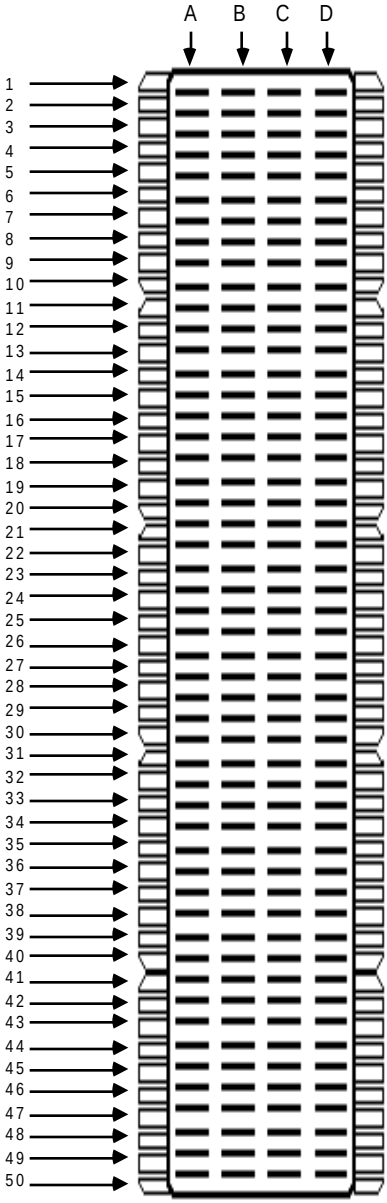

Figure A-1. Punch Down Block

APPENDIX B

EPIM SPECIFICATIONS

Network (Twisted Pair) Interface

Internal Transceiver:	Cabletron Systems TPT Transceiver. Refer to the **TPT Twisted Pair Transceiver** User's Manual.

EPIM-T (10BASE-T Twisted Pair Port)

Internal Transceiver:	Cabletron Systems TPT 10BASE-T Twisted Pair Transceiver
Type:	8 Pin RJ45 Jack (Fig. B-1).

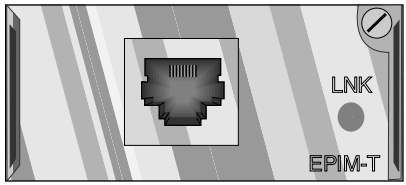

Figure B-1. EPIM-T (with RJ45 Port)

A slide switch on the EPIM-T determines the cross-over status of the cable pairs. The switch residing on the **X** side indicates the pairs internally cross over. If the switch resides on the **=** side, the pairs do not internally cross over. (See Fig. B-2.)

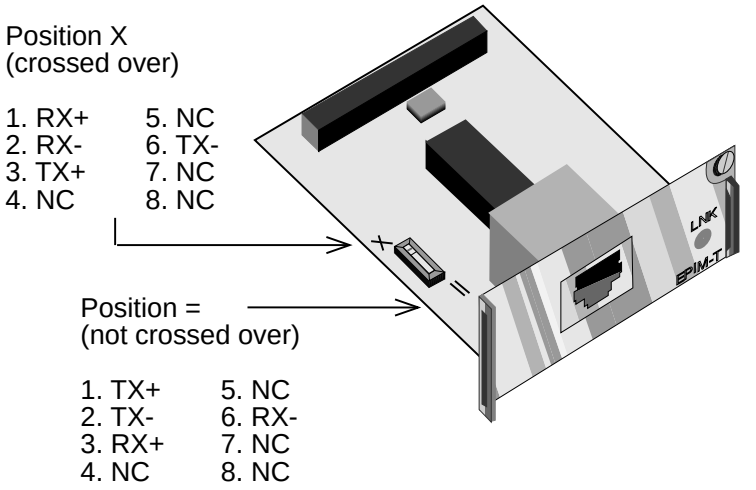

Figure B-2. Cross-over Switch on the EPIM-T

EPIM-F1/F2 (Multimode Fiber Optic Port)

Internal Transceiver:	Cabletron Systems FOT-F™ Fiber Optic Transceiver
Type:	
EPIM-F1:	SMA fiber optic ports (Fig. B-3)
EPIM-F2:	ST fiber optic ports (Fig. B-3)

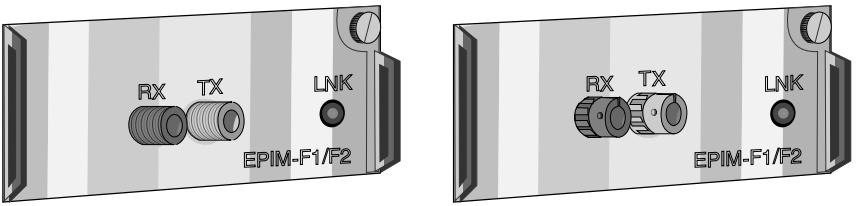

Figure B-3. EPIM-F1 and EPIM-F2

Receive Sensitivity:	-29.5 dBm
Max Receive Power:	-8.2 dBm
Transmitter Power Into:	
50/125 µm fiber:	-13.0 dBm
62.5/125 µm fiber:	-10.0 dBm
100/140 µm fiber:	-7.0 dBm
Bit Error Rate:	Better than 10^{-10}

Note: *The above transmitter power and receive sensitivity levels represent Peak Power Levels after optical overshoot. You must use a Peak Power Meter to correctly compare the above values to those you measure on any particular port. If you measure Power Levels with an Average Power Meter, you must subtract 3 dBm from the measurement to correctly compare measured values to the above values (e.g., -29.5 dBm peak = -32.5 dBm average).*

EPIM-F3 (SINGLE MODE FIBER OPTIC PORT)

Internal Transceiver: Cabletron Systems FOT-F3™ Fiber Optic Transceiver

Type: ST fiber optic ports (Fig. B-4)

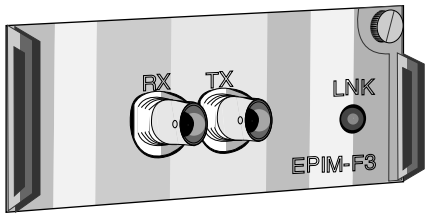

Figure B-4. EPIM-F3

Note: *Transmitter power is inversely proportional to temperature rise. Use the Output Power Coefficient to calculate increased or decreased power output for your operating environment. For example, typical power output at 25ºC equals -16.4 dBm. For a 4ºC temperature increase, multiply the typical coefficient (-0.15 dBm) by four, and add the result to typical output power (4 x -0.15 dBm + -16.4 dBm = -17.0 dBm).*

Parameter	Typical	Minimum	Maximum
Transmitter Peak Wave Length:	1300 nm	1270 nm	1330 nm
Spectral Width:	60 nm	—	100 nm
Rise Time:	3.0 ns	2.7 ns	5.0 ns
Fall Time:	2.5 ns	2.2 ns	5.0 ns
Duty Cycle:	50.1%	49.6%	50.7%
TX Power:	-15.1 dBm		
TX Budget:	14.4 dBm		
RX Sensitivity:	-29.5 dBm		
MAX Receive Power:	-6.99 dBm		
Bit Error Rate:	Better than 10^{-10}		

Note: *The above transmitter power levels and receive sensitivity levels represent Peak Power Levels after optical overshoot. You must use a Peak Power Meter to correctly compare the above values to those you measure on any particular port. If you measure Power Levels with an Average Power Meter, you must subtract 3 dBm from the measurement to correctly compare those measured values to the values listed above (e.g., -29.5 dBm peak = -32.5 dBm average).*

EPIM-C (BNC PORT)

Internal Transceiver:	Cabletron Systems TMS-3™ Transceiver
Type:	BNC receptacle, with gold center contact, for use with BNC type tee-connectors and RG-58 thin-net cable (Fig. B-5).

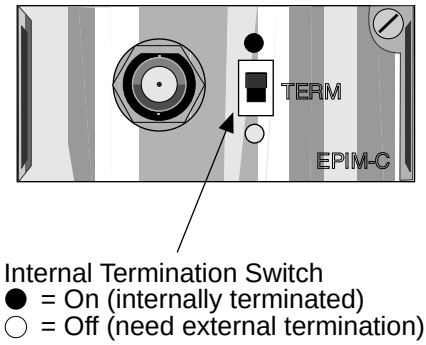

Figure B-5. EPIM-C (with BNC Port)

Termination:	Using the switch to the side of the port, you can internally terminate the port on the module via a built-in 50 ohm terminator. This eliminates the need to connect the port to a tee-connector and terminator.

Grounding: For safety, connect only **one** end of a thin-net segment to earth ground. Do not connect the BNC port of an EPIM-C to earth ground.

Warning: *Connecting a thin-net segment to earth ground at more than one point could produce dangerous ground currents.*

EPIM-A AND EPIM-X (AUI PORT)

Interface Connector: DB-15 Port (female connector for EPIM-A, male connector for EPIM-X) (Fig. B-6).

Type: 15 position D type receptacle

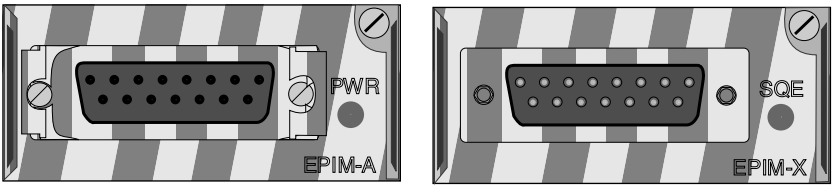

Figure B-6. EPIM-A and EPIM-X (AUI Port)

Pin	1	Logic Ref.	Pin	9	Collision -
	2	Collision +		10	Transmit -
	3	Transmit +		11	Logic Ref.
	4	Logic Ref.		12	Receive -
	5	Receive +		13	Power (+12 Vdc)
	6	Power Return		14	Logic Ref.
	7	No Connection		15	No Connection
	8	Logic Ref.			

Connector Shell: Protective Ground